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Intensive care for sick neonates, the earlier the better: Improved survival rate of IRDS children, referred by means of a mobile neonatal intensive care unit

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1 Introduction

Development of Neonatal Intensive Care Units (N.I.C.U.'s) in the last twenty years, has markedly reduced neonatal mortality and morbidity rates [2, 8]. Several studies have shown another, maybe even more important, consequence: the improvement of long-term prognosis c.q. the quality of survival of the children involved [3, 7].

Although increasing possibilities exist to anticipate certain perinatal events (by antenatal diagnostic- and perinatal monitoring procedures) and thus, to effectuate so-called „intra-uterine" transportation of "at-risk" children, a number of sick neonates still have to be transferred to N.I.C.U.'s after birth. By now it is well accepted that, as far as the referred children are concerned, **the effectiveness of a neonatal unit depends to a considerable extent on the total amount of medical care given to the child (before- and at birth, before and during transportation) before admission** [1].

Accepting the special needs of sick neonates during transportation implies, that every N.I.C.U., receiving larger quantities of these children should have special-transport facilities, because transportation of a sick newborn infant is ideally an extension of the newborn intensive care and is by no means a simple transfer manoevre [6].

Since September 1976 sick neonates have been transported by a specially designed mobile intensive care unit (Babylance) accompanied by personnel capable of managing neonatologic problems, to the two university hospitals situated in the city of Amsterdam.

To evaluate the possible effect of institution of such a transport-service, results have been compared between two groups of children suffering from the idiopathic respiratory distress syndrome (I.R.D.S.), that is, the groups of I.R.D.S. -neonates referred in the last year prior to – and in the first year after institution of the special-transport

Curriculum vitae

BERNARD PIERRE CATS *was born in 1944. He studied medicine at the Municipal University of Amsterdam and obtained his medical degree in 1968. He qualified in pediatrics at the Free University of Amsterdam from 1970–1974. From 1974 to 1977 he specialised in clinical and research work in the field of neonatology and worked as a supervisor of the neonatology-ward of the Free University Clinic of Pediatrics in Amsterdam. Since December 1977 he works as a staff-neonatologist in the Dept. of Neonatology, Wilhelmina Children's Hospital in Utrecht. His main interests are ventilatory mechanics in newborns, ventilator regimes in I.R.D.S.-treatment, metabolic and circulatory changes during C.D.P.-therapy.*

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service. These groups will be designated below as N.S.T. (=non special transport) and S.T. (= special transport) group.

2 Results

Throughout the reviewed period the diagnosis I.R.D.S., based on clinical and radiological criteria, was made in 55 and 62 referred neonates respectively.

Tab. I. Sex distribution, mean gestational age and -birth-weight in the groups compared.

	'75–'76: N S T		'76–'77: S T
n	55	–	62
♀ : ♂	24 : 31	N.S.*	28 : 34
mean gest. age (wks)	32,01	N.S.**	31,48
mean birth weight (gms)	1855	N.S.**	1735

* Fisher 2 × 2 t
** Student – t

Tab. I shows that the groups were comparable to each other, with respect to gestational age, birth-weight and sex-distribution.
Acid-base balance and temperature on admission were felt to correlate quite well with the clinical condition in most instances. In Tab. II mean pH and temperature values are listed. Mean pH values are the same, while mean temperature on admission is significantly higher in the "special-transport" (S.T.) group.

Tab. II. Mean pH and rectal T in the NST and ST group.

	'75–'76: N S T		'76–'77: S T
mean pH on admission	7,19	N.S.**	7,20
mean T (°C) on admission	35,69	< 0,05**	36,07

** Student – t

The mean time-lag between birth and start of the transport was significantly shorter in the S.T.-group (Tab. III). This means that intensive care for these children started about 7 hours earlier (adding an average transport time of 3/4-1 hour to the difference in the N.S.T.-group).

Tab. III. Time-lag between birth and start of transport.

	'75–'76: N S T		'76–'77: S T
interval (in hours) between birth and start of transport	14,83	< 0,05**	8,52

** Student – t

Tab. IV gives information about those children needing ventilatory assistance (V.A.) (consisting of nasal C.P.A.P. and/or artificial respiration). As can be seen, the need for V.A. in the two groups and the mean V.A.-time in the survivors have not significantly changed. **The survival rate is nevertheless significantly better in the S.T.-group**, which seems to be related to the fact that a larger proportion of these children could be treated by either C.P.A.P. alone or by artificial respiration after having been primarily treated with C.P.A.P.
This could also be regarded as one of the beneficial effects of earlier referral because evidence now exists that applying continuous distending pressure in an early phase of the I.R.D.S. gives better results [4, 5].
Tab. V gives the overall survival-rates in the two groups which also show a significantly higher survival in the S.T.-group.

3 Discussion

In view of the fact that criteria for diagnosing and treating the I.R.D.S. in the two referral centers, did not change through the period reviewed, and that the two groups compared are not clearly differing from each other with respect to gestational age and birth-weight, it may be argued that the changing figures could be attributed to other factors. To our knowledge, no essential changes have occurred in the general aspects of medical care given to these children, prior to transport. The fact that in the second period children were on an average referred earlier might however indicate that **referring pediatricians have become more**

Tab. IV. Children needing ventilatory-assistance
(abbr: C.P.A.P. = continuous positive airway pressure
A.R. = artificial respiration).

	'75–'76: N S T		'76–'77: S T
children needing ventilatory-assistance (V.A.):	35/55	N.S.*	30/62
C.P.A.P.	8		13
C.P.A.P. → A.R.	10		8
A.R.	17		9
survival-rate of children needing ventilatory-assistance:	12/35	< 0.05*	19/30
C.P.A.P.	5/8		13/13
C.P.A.P. → A.R.	2/10		4/8
A.R.	5/17		2/9
mean duration (in hours) of ventilatory-assistance in the survivors:	75.80	N.S.**	91.00

A.R. = artificial respiration
N.S.: not significant

* Fisher 2 × 2 t
** Student – t

Tab. V. Overall survival rate in the NST and ST group.

	'75–'76: N S T		'76–'77: S T
overall survival-rate	31/55	< 0.05*	47/62

* Fisher 2 × 2 t

aware of the special care these babies need and of the fact that they need this as early as possible.
It seems highly probable therefore that the changes found have been caused mainly by the fact that the idea of intensive care has been brought to the referring pediatricians (maybe via the "Babylance") resulting in a concomitant earlier start of intensive care and transport in an appropriate way.

Summary

A mobile intensive care unit has been used since september 1976 in the region referring sick neonates to the two University Hospital NICU's of Amsterdam.
The present study compares two groups of neonates (suffering from the I.R.D.S.) i.e. a group that had been referred by non specialized transport teams (N S T-group) and a group admitted after institution of the neonatal-transport service (S. T.-group).
Significant difference is found in the temperature on admission (S T group > N S T group). In the N S T- and the S T-group the need for ventilatory assistance was not significantly different but in the S T-group it was started significantly earlier.
Survival after institution of ventilatory assistance and overall-survival are significantly better in the S T-group. These conclusions point to the fact that administering intensive care to sick neonates as early as possible and **transportation of this group by means of special "neonatal"-transport services increases their survival rates.**

Keywords: Idiopathic respiratory distress syndrome, intensive care, neonatal transport service.

Zusammenfassung

Intensivüberwachung von kranken Neugeborenen –je früher, desto besser: Verbesserte Überlebensrate von RDS-Kindern, zurückzuführen auf den Einsatz von mobilen Intensivüberwachungs-Einheiten.
In der Region von Amsterdam kam seit September 1976 eine mobile Intensivüberwachungs-Einheit zum Einsatz, um kranken Neugeborene zu den beiden der Universität angeschlossenen Intensivüberwachungs-Stationen zu transportieren.
Die vorliegende Studie vergleicht zwei Gruppen von Neugeborenen, die an einem idiopathischen Atemnotsyndrom (IRDS) erkrankt waren. Die eine Gruppe bestand aus

Kindern, deren Transport durch 'Nicht-Spezialisierte Transportteams' (NST) erfolgte, während sich die zweite Gruppe aus Kindern rekrutierte, die nach der Einrichtung des neonatalen Transport-Service in den Vorzug eines 'Spezialisierten Transportes (S T) kamen.
Ein signifikanter Unterschied wurde hinsichtlich der Körpertemperatur gefunden (S T > N S T). Die Notwendigkeit des Einsatzes einer Atemhilfe war zwischen den Gruppen nicht signifikant verschieden. Die Atemhilfe kam jedoch in der S T-Gruppe bedeutend früher zur Anwendung.

Die Überlebenschance nach Einsatz der Atemhilfe sowie die Überlebenschance im allgemeinen sind in der S T-Gruppe signifikant höher.
Diese Schlußfolgerungen verweisen auf die Tatsache, daß eine für kranke Neugeborene so früh wie möglich einsetzende Intensivüberwachung sowie der Transport der betroffenen Kinder mit Hilfe von "Neugeborenen-Transport-Service-Einheiten" deren Überlebensrate beträchtlich erhöht.

Schlüsselwörter: Idiopathisches Atemnotsyndrom, Intensivüberwachung, neonataler Transport-Service.

Résumé:

Soins intensifs aux nouveaux-nés: Le plus tôt le mieux-Amélioration du taux de survie des enfants avec asphyxie périnatale protopathique grâce au transfert par unité mobile de soins intensifs néonataux
Une unité mobile de soins intensifs fonctionne depuis septembre 1976 dans la région de transfert des nouveaux-nés aux deux Services hospitaliers universitaires de Soins Intensifs Néonataux d'Amsterdam.
L'étude présente est consacrée à la comparaison de deux groupes de nouveaux-nés (souffrant d'asphyxie périnatale protopathique), c.à.d. un groupe ayant été transféré par des équipes de transport non spécialisées (Groupe NST) et un groupe admis après la création du service de transport néonatal (groupe ST).

Une différence significative a été observée dans les températures à l'admission (groupe S.T. > groupe N.S.T.). Le besoin d'assistance ventilatoire a été à peu près identique pour les deux groupes, mais elle a été pratiquée beaucoup plus tôt dans le groupe S.T.
The taux de survie aprés création de l'assistance ventilatoire et la survie générale sont nettement supérieures dans le groupe S.T.
Ces observations permettent de conclure que l'administration immédiate de soins intensifs aux nouveaux-nés et **le transport de ce groupe par les services spéciaux entraînent une hausse notoire des taux de survie.**

Mots-clés: Amélioration du pronostic, asphyxie périnatale protopathique, service de transport néonatal, soins intensifs.

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